Journal De Physique. IV : JP 2005 vol.131, pages 27-32

Superconductivity, charge order and anomalous magnetism in sodium cobaltates

Alloul H., Mukhamedshin I., Blanchard N., Collin G.
Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia

Abstract

Oriented powder samples of NaxCoO2, with quasi single phase composition have been synthesized and studied by x rays, SQUID magnetometry, 23Na and 59Co NMR. We evidence that the dry and superconducting (SC) samples with x ≈ 0.35 differ from those with 0.50 ≤ x < 1 inasmuch as the Co sites display an uniform charge state in the former while they differentiate markedly in the latter. For 0.50 ≤ x < 1, the local Co charge and magnetic properties appear correlated with definite orderings of the Na+ ions. For x ≃ 0.70 we could distinguish non magnetic Co3+ sites with no spin susceptibility from more magnetic Co sites, among which Co4+ sites can be excluded. These sites form a single strongly correlated electronic band which exhibits a quasi localized T dependent magnetism which might only become Fermi liquid like below 2K. This contrasts with the Pauli like magnetism found for x ≈ 0.35 in the dry and SC compounds. Those display quasi identical metallic states, with a weak spin susceptibility which only contributes to a small shift of the 59Co NMR. Its variation below Tc reveals a strong suppression of the spin susceptibility, compatible with singlet superconducting pairing. © EDP Sciences.

http://dx.doi.org/10.1051/jp4:2005131006